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Introduction

1 Writing of the Mediterranean, Fernand Braudel (1990: 253) has remarked, "It isn't water that links its shores," but "seafaring peoples." From a very early date, the Indian Ocean, too, was traversed by sailors, traders, religious men, and migrants moving in search of goods, new lands, or the great unknown. Their movements were shaped by numerous factors, both geographic and social in origin. Exchanges are not solely shaped by geographic and economic factors, but also by systems of ideas and by the balance of power. Over centuries, these exchanges transformed the Indian Ocean into a unified space. The cartographic presentation of the Indian Ocean in the Middle Ages is a special case in the history of cartography, still puzzling the historians of geography (more on that below). The present contribution offers some remarks on probabilities and patterns of knowledge transmission across time and massive diversity of Islamic societies of the region and to assess its place in the history of Islamic science and civilization. The source base is the corpus of medieval Arabic compositions having to do with geography, travel, and sailing on the Indian Ocean. Two vectors of knowledge transfer are explored: (1) between formal and informal geographical records and (2) between academic geography and the practical knowledge of the ocean and its coasts by Indian Ocean mariners.

2 The earliest extant Arabic sources dealing with the Indian Ocean date to the ninth century A.D. It has been long established that the founders of Islamic world geography relied significantly on Greek sources, in particular on the *Geography* of Claudius Ptolemy (*c.* 90 - 168 A.D.). The following discussion will first touch on a few early examples illustrating the transmission of Antique geographical information about the Indian Ocean in very general terms. One of the early Arabic interpreters of Ptolemy (both in astronomy and geography) was Muhammad ibn Musa al-Khorezmi, or Khuwarizmi (d. *c.* A.H. 232/846-847 A.D.). In the desription of African coastal locations of the First Climate and those south of the Equator, he transribes a number of port cities with their geographical coordinates (see Mžik, 1926). There is, however, no narrative describing the ocean in the imperfectly preserved unique manuscript, although it probably existed because we can find a brief sketch in *Kitab al-Zij al-Sabi`* of al-Battani (*c.* A.H. 244-317/858-929), a later translator of Ptolemy's tables than al-Khorezmi, who provides the ocean's dimensions:

3 They had measured the Sea of India and say that its length, counting from the west to the east, from the limits of Ethiopia (*al-Habash*) to the borders of India (*al-Hind*) is 8 000 miles, while the width is 2 700 miles. It extends 1 900 miles south of the island of the Equinox. Near the land of Ethiopia the sea forms a gulf in the direction of the Barbara, called *al-Khalij al-Barbar*i (that is, *Sinus Barbaricus* – M.T.); its length is five hundred miles and the width of its seabed is one hundred miles... (Kubbel' and Matveev, 1960: 298).

4 Within a century from the first translation of Ptolemy, his data were adopted and transmitted further: The same numbers are quoted a few decades later in *Kitab al-`Unwan* ("Book of Chapter Titles") by the Christian historian Agapius of Manbij (mid-to late 10th centyr A.D.), who omits the tables of geographical coordinates, but preserves narrative sections about the Earth and its regional divisions and includes the chapter "On the Seas, Gulfs, and Islands" (Kubbel and Matveev, 1960:129-130).

> The monsoon climate of the Indian Ocean was known to the Hellenistic Greeks: *Periplus of the Erythraean Sea* (*c.* 70 A.D.) ascribes its discovery to the Greek navigator Hippalus (1st century B.C.). The same source credits Arab seamen with plying the searoutes of the Indian Ocean, at least of its western part, as far as Ceylon, or the Greek Taprobane, now Sri Lanka. (Huntingford, 1980, 119 *et passim*)[1]

5 The earliest Arabic reference to the regularity of Indian Ocean monsoons is to be found in the *Kitab al-Buldan*, "Book of Countries" (*c.* A.H. 289-290/902-903 A.D.), by Ibn al-Faqih al-Hamadani, one of the founders of Islamic descriptive geography:

> Know that the Seas of Persia (*Fars*) and India are in fact one sea because they join one another, except that they are unlike each other [for navigation]. . . As to the Sea of India, shortly before the Spring Equinox, when the Sun is the constellation of Pisces, it becomes dark and hard. Many waves appear, and nobody sails it because of the dark clouds and storms while the Sun is in the Gemini. When the Sun moves to the constellation of Virgo, the darkness of teh sea dissolves and navigation becomes easy, until the Sun again reaches Pisces. The Sea of Persia is navigable in all seasons, but people refrain from sailing the Sea of India during its stormy period due to the darkness and difficulties. (Kubbel' and Matveev, 1960:72)

6 In the tenth century, to the formal and general descriptions of the known parts of the world are added travel accounts. Of these, *The Marvels of India* (*`Adja'ib al-Hind*, *c.* 953 A.D.), are full of *mirabilia* stories and sailor adventures in ships, ports, and islands of the ocean. In the case of the historian al-Mas`udi (d. A.H. 345-346/965 A.D.), to his awareness of formal geographies of the world and the region is added his personal travel experience. We benefit from his first-hand knowledge of Arabia, India, Ceylon and China as well as the

East African coast. Mas`udi is familiar with Classical geographical placenames: he calls the western Indian Ocean the "*Habashi* Sea", that is "Ethiopian", in the tradition of Greek usage of "Ethiopia" for not strictly Abyssinia (the toponym derived from the Arabic " *Habasha* for Ethiopians, their neighbors across the Red Sea), but also for sub-Saharan Africa as a whole. On the other hand, Mas`udi also indicates a degree of familiarity with Arabic maps of the region. In his *Muruj adh-Dhahab* ("Gold Meadows") he says: "The Sea of the *Zanj* and the *Ahabish* is to the right of the Sea of India, even though their waters adjoin" (Kubbel and Matveev, 1960: 239). The words "to the right" indicate that Mas`udi visualizes a cartographic representation of the ocean according to the dominant in Islamic cartography orientation to the south (some maps show orientation to the east).

7 Al-Mas`udi also knows of al-*Khalij al-Barbari*, or the Barbari Gulf of the Ethiopian Sea, originating in Ptolemy's *Geography*. The Arabic ethnonym "Barbara," in the context of northeast Africa (as opposed to *Barbar* in North Africa), refers to Kushitic populations of Somali and the Red Sea coast in its southern part on the African side. Thus, "Sinus Barbaricus" or the "Barbari Gulf" of the Indian Sea is the Red Sea, and especially its souther part; the western part of the Indian Sea is also called the "*Habashi*" (that is, Abyssianian, or Ethiopian) Sea in earlier Arab geographies. The northern part of the Red Sea is usually called *Bahr al-Qulzum*, so named after the port village of Clysma at the northern point of the Guf of Suez; this name eventually drives out the use of the term "*al-Khalij al-Barbari*," except in old-fashioned retellings of the globe's major geographical features. On Ptolemy's extant Latin maps, the Red Sea is named "*Sinus Arabicus*", but a Greek manuscript map of Ptolemaic "Aithiopia below Egypt," produced around 1400, shows the name "*Barbarikios*" off the eastern seaboard (Berggren and Jones, 2000: Plate 5). It should be noted that the red coloring, used in European mappaemundi for the Red Sea,[2] was never applied in Islamic maps. The 1482 print world map of Ptolemy shows the red tint applied not to the Red Sea itself, but to the part of the Arabian Sea that later became known as the Gulf of Aden (Berggren and Jones, 2000, Plate 6).

8 Thus, beginning with late-Hellenistic and early-Roman period and reaching into the Islamic "Golden Age," written evidence registers the Arab presence in the western Indian Ocean; it confirms Arab knowledge of the sea and the use of Arabic as both a source of information and medium of international communication and transmission of knowledge. By the tenth century Arabic scholarship had produced a synthesis of received, preserved older and newly-developed knowledge. This body of classical Islamic geography combined or absorbed, in varying degrees, these three recognizable, if not independent, streams: (1) Greek ecumenic geography (largely, but not exclusively, Ptolemy), (2) Arabic-Islamic travel narratives, and (3) Islamic cartography. It will be noticed that the list does not include Persian geography or a separate mention of Greek cartography; this latter will be discussed below. The former remains a lacuna, a question mark. Despite the evident, and recognized, impact of pre-Islamic Persian geography on Islamic regional geography and despite Persian participation in Indian-ocean trade and other maritime activities, well illustrated in the *Marvels of India*, since at least the Sassanid period, we lack tangible narrative evidence of specific and identifiable Persian elements in the mainstream representation of the Indian ocean in early Islamic scholarship as a maritime entity beyond a simple enumeration of the traditional "Seven Seas" (in parallel with the Seven Climates, the Persian *kishvar-ha* regions, as distinct from the latitudinal Greek *κλίματα*).

9 For the best example of Greek influence on Islamic geography – and cartography – we first return to Ptolemy and then leap forward to the 12th century, when Muhammad al-Idrisi (A.H. 493-560/1100-1165 A.D.) produced a world geography and a related series of maps considered the pinnacle of Arabo-Islamic geography.[3] Idrisi worked at the Norman court of Sicily where, under patronage of Roger II (1098-1154), he had access to both Arabic and European sources, some of which he names. Born in Morocco, Idirisi traveled at least as far east as Asia Minor, but much of his book is data compiled from earlier works. The projection of Idrisi maps is uniquely original and has not yet been explained. The undisputed and strongest systemic influence, however, came from Ptolemy. The narrative follows the maps, observing the Greek system of the Seven Climates that start from the Equator and rise to the Northern Polar Circle. Idrisi adds a section south of the Equator and instead of degrees of latitude and longitude he breaks the map up into ten sections per clime. In each section, major cities and geographical features (sea, lakes, rivers, mountains) are named and described, with added ethnographic and cultural information, sometimes contemporary and sometimes long since outdated.

10 In medieval maps of Ptolemy the Indian Ocean is enclosed. It is not enclosed on Islamic maps. An aberrant and as yet unexplained exception is the schematic map of the Indian Ocean in the recently discovered *Book of Curiosities*, thought to be produced in the late eleventh century (Johns and Savage-Smith, 2003: 8); it therefore predates al-Idrisi. Islamic world geographies consider the Indian Ocean an offshoot of the Surrounding Ocean (*al-Bahr al-Muhit*). The encyclopedist al-Biruni (*c.* A.H. 362-440/973-1048 A.D.) explained this in *Kitab al-Tafhim* ("Book of Instruction in the Elements of the Art of Astrology"):

> From the Eastern side, beyond the fathest limits of the land of China, the Surrounding Sea is likewise impassable. From it branches out a gulf that forms a sea that is named in each location by the name of the country it washes, so that at firist it is the Sea of China, then the Sea of India. From the sea, in turn, branch our great gulfs that are separately named seas, such as the Sea of Persia and Basra... (Matveev and Kubbel, 1965: 113)

11 Biruni is the only Islamic autor who specifically articulates the undividsibility of the world's oceans. In his other book, *al-Qanun al-Mas`udi* ("Mas`ud's Canon for Astronomy and Stars") he wrote about the Indian Ocean past southeast Africa:

> Regardless of such (great difficulties) there is no absolute obstacle for reaching the Ocean Sea (*Bahr Uqiyanus*) through these narrows or from the south behind these mountains. I have found indications that the two (seas) join together even though I have not seen this with my own eyes. (Matveev and Kubbel, 1965: 125)

12 Idrisi's Indian Ocean is open in the east, but in his sectional maps the eastern coast of Africa turns east above the Equator and forms the ocean's south coast extending to Indonesia. Idrisi's *Geography* (*Kitab Nuzhat al-Mushtaq*) in general had a strong impact on Islamic world cartography and descriptive geography, especially in the western Islamic lands. While Ptolemy was not yet lost to Idrisi, the latter's overall influence in some ways reduced the felt need for ancient authorities. References to "Sharif al-Idrisi" made citing Ptolemy less necessary for later compilators, at least in geographical matters.

13 Idrisi's superiority in both descritive geography and cartography is unarguable, yet on the subsequent situation is somewhat paradoxical. Many later authors drew on al-Idrisi, but, considering the expansion of travel and production of new astronomical data that might reasonbly be expected to lead to growth of geography as a discipline, there appears to be a lack of systemic originality and loss of precision in world geography and cosmographical genre. The Idrisi sectional map system was not used at all, nor further

developed by later authors, although it was not lost.[4] In terms of geographical data, the closest Idrisi follower is Ibn Sa`id al-Maghribi (c. A.H. 610-685/1214-1286 A.D.).[5] His *Geography of the Seven Climates* (Ibn Sa`id, 1970) follows the Idrisi narrative according to the map sections, repeating much of his information, but for locations Ibn Said adds the coordinates. The round world map ascribed to Ibn Sa`id al-Maghribi opens the Indian ocean wider toward the south than any Islamic world map previously. He fills the ocean space with islands and, unable to accommodate all the placenames provided by Idrisi on the East African coast, divides the southern African continent by a deep gulf, with double the coastline looking east (Harley and Woodward, 1992: Plate 10).[6]

14 By contrast with sectional maps, the so-called round world map of Idrisi,[7] lacking many if not most sectional details, became quite popular, and a version of it appears in manuscripts of Ibn Khaldun's *Muqaddima*. Thus, with al-Idrisi, a comprehensive picture of the Indian Ocean is created, from Africa to China, but certain lines of knowledge transmission wither away or become dormant.

15 Should we seek the reason for such lack of vitality in the nature of academic instuitutions of the age or elsewhere? We know that expansion of Islam continued along the coasts of the Indian Ocean, whether in Eastern Africa or Indonesia, as it did on the Indian subcontinent. New Islamic states arose and maritime commerce prospered. The famous 14th century traveler Ibn Battuta (1304-1369) performed several voyages on the Indian Ocean and left a record of them in the *Rihla*, or "Book of Travels".[8] His experience in southeast Asia and somewhat hazy report of reaching China provide, at the very least, a personal confirmation, if not a case study of the widely reaching shipping and trade networks emanating from or converging on certain vital points of destination – Red Sea ports for the annual Muslim pilgrimage, Kilwa for the gold trade of the interior, Ceylon as the crossroads of the oceanic routes and a waiting-haven for the change of monsoon. While in India, he aspired to reach China and discovered that the voyage could be made only on Chinese ships. Indeed, in the early 15th century China was to make the exploration of the Indian Ocean an imperial project, though Arabic sources are silent about this.

16 No other Arab traveler left as comprehensive a record of personal voyages on the Indian Ocean, but a 13th-century traveler in South Arabia related an extraordinary story about the far and early reaches of the monsoon sailing routes. Writing about A.H. 624-627/1226-1230 A.D., Ibn al-Mujawir describes maritime contacts between Madagascar, East African coast, Aden, and eventually Siraf (the Persian Gulf port destroyed by an earthquake about 970):

> The building of Aden. When the dynasty of the pharaohs came to an end, the place fell into ruins as their dynasty disappeared. A group of fishermen settled the island, fishing there. They remained a long time thus, provided with God's sustenance and a livelihood, until some Madagscans (*Ahl al-Qumr*)[9] arrived in ships with lots of peopleand took control of the island after chasing out the fishermen by force. They settled the Summit of al-Jabal al-Ahmar, Huqqat and Jabal a-Manzar, a mountain overlooking the boatyards. Traces of them still exist and their building remains in Stone and gypsum, brought from these wadis and mountains. (Smith, 2008: 137-138)

17 This passage is quite rare in Arabic travel literature in providing a glimpse of oceanic migration history that connects Malay and East African immigrants to South Arabia and makes clear the northward direction of the movement, as distinct from the relatively frequent mentions of southern Arabians (especially Omanis) sailing to East Africa.

Continuing the story of Aden, the author also describes the migrants'vessels and the sailing regime:

> They used to come up from Madagascar, taking in Aden in one go in one monsoon [...] From Aden to Mogadishu is one monsoon, from Mogadishu to Kilwah a second and from Kilwah to Madagascar a third. But [some] people would turn the three monsoons into one: in 626[10] a ship sailed from Madagascar to Aden in this way, setting sail from Madagascar, making for Kilwah, but dropping anchor in Aden. Their ships have outriggers on account of the narrowness, rockiness and shallowness of their seas. When these people became weak and the East Africans got the better of them, they forced them out and took over their land and settled the wadi, a place which is now inhabited [by people] in reed huts. They were the first to build reed huts in Aden.When they had gone, the place fell into ruin and remained thus until the inhabitants of Siraf moved out [and settled there]. (Smith, 2008: 138)

18 Ibn al-Mujawir's *Tarikh al-Mustabsir* "History of the Observer" is a local history, a traveler's itinerary, and a catalog of comercial articles and prices rolled into one. It is original and unique in the type and amount of detail for the period and the region, describing the cities and towns of Southern Arabia, local dynasties, and social mores. There are even some city maps, but the book does not easily fit the established genres either in history or geography. While it draws on some literary resources, the book does not appear either to build on prior geographical treatises or to be widely cited in later works. In tracing the lines of transmission of knowledge, Ibn al-Mujawir stands somewhat isolated, egardless of the original and valuable information he presents. In that regard, there is a smilarity between his book and Ibn Battuta's *Rihla*. Although extensive, Ibn Battuta's record is neither formal nor learned: he was not a geographer and apparently not much of a reader, though he had a prodigious memory. On occasion he cites a verse or a foreign word, repeats a story of a saint or relates the information told him in the many audiences he attended at various courts. He started his journeys with a pilgrimage to Mecca and then never ceased to miove from place to place, eventually returning to his homeland of Morocco. His secretary-editor may have added to his stories excerpts from the records of an earlier pilgrim and traveler such as Ibn Jubayr (12th century), but there are no quotes from learned treatises or encyclopedic disctionaries. The stories of his voyages, shipwrecks, and wanderings around the islands are memoirs of his personal experience in and of the very interconnected universe of the Indian Ocean (that he only refers to as the "sea," with no learned comments on its gulfs or divisions). Ibn Battuta was a passenger on ships piloted by someone else, and his concerns were about his safety, comfort, secruity for his belongings and his entourage, and getting to the destination. He names quite a few types of ship and survives more than one storm, but he knows nothing about navigation or shipping except for the dictate of the monsoon and the danger of piracy. For first-hand, profesional information about navigating the Indian Ocean, we need to turn to the late-15th century sources, particularly to the works of the outstanding pilot and now patron-saint of the mariners Shihab al-Din Ahmad ibn Majid al-Sa`di al-Najdi (*c*. 1421-1500).

19 Ahmad ibn Majid (or simply Ibn Majid) was an expert navigator whose career took place apparently entirely in the Indian Ocean, on the very eve of the arrival there of the Portuguese in the late 15th century. His reputation for knowledge, skill and expertise rests on his role as a teacher of naval arts for he has left an exceptionally rich heritage of written works, including a nautical encyclopedia and a number of didactic compositions and sailing instructions for certain oceanic routes. He authored a total of about forty

works in prose and verse, of which more than 20 have survived.[11] Among the reasons we greatly admire Ibn Majid's encyclopedic knowledge of the sea and his nautical expertise is that no earlier sailing manuals or treatises on naval arts have reached us. His work looks all the more original that there is nothing to compare it with among the earlier known works.

20 This is not to deny the use by Ibn Majid of previously developed knowledge. The training of pilots and ship masters was a matter of oral instruction and constant practice. The orality is confirmed by the choice of verse form, in the easy *rajaz* metre for easier memorization, for the sailing instructions. Ibn Majid's own father is acknowledged by him as *mu`allim al-bahrayn*, "the Pilot of Two Seas" (Tibbets, 1971, 8). He also respectfully refers to three of his predecessors — Arabian pilots awarded the honorary title of "Lions of the Sea" (*luyūth al-biḥār*), numbering himself the fourth (Tibbets, 1971, 5). All other contemporary writers on navigation (for such existed and he was aware of them) he believed to be not authors, but compilers; he boldly claimed that his own knowledge was the most correct, complete, and accurate. In his case, transmission of nautical knowledge was a constant teaching task to which he was dedicated, often reminding the intended student-captains of the superiority of his store of information over what might be found elsewhere (Shumovskii, 1957, 81).

21 It is important to emphasize that Ibn Majid's sailing instructions are not general descriptions of sailing routes between the points of departure and destination, such as can be reconstructed from the stories of the *Marvels of India*, al-Mas`udi's travels, or Ibn Battuta's *Rihla*. They are detailed guidelines for key points of each route, with guidelines for the use of stars and constellations expected to be seen in the monsoon season appropriate for the location. Ahmad ibn Majid is not unaware of Ptolemy[12] and some prominent geographical concepts derived from Antique geography (such as the Mountains of the Moon[13] as the source of the Nile) but, if we saw above very little cross-over between academic geography and travel literature, here we find no overlap between the works on navigation and either formal geography or travel literature. Tibbets has identified in Ibn Majid's nautical encyclopedia *Kitab al-Fawa'id* ("The Book of Useful Information about the Seas and Principles of Navigation") a number of earlier sources and possible influences, but they are mostly astronomical works, including Ptolemy's *Almagest* (see Tibbets, 1971: 40, 158). There is no evidence of borrowing from learned treatises of descriptive geography, and even in regard to the works of astronomy or mathematical geography there is a degree of skepticism. "All the other works quoted in the *Fawa'id* either by name or anonymously," says Tibbets, "are really used for literary embellishment, for their poetry or for a story only remotely connected with the text, and not for navigational purposes" (Tibbets, 1971: 41).

22 Against the current background of our limited knowledge of past nautical activities, methods, and routes, Ahmad Ibn Majid's legacy does not suffer from comparison with other authors, whether contemporaries or predecessors. His compositions are not compilations of earlier works, even if he sometimes repeats himself. Rather, they are rooted in personal experience and had been tested over decades of sailing over various parts of the Indian Ocean. Tibbets suggests that Arab sailing manuals may have existed since the 11th century A.D., but he is hesitant as to whether Ahmad ibn Majid had access to such (Tibbets, 1971, 4—6).[14] In the 13th century Marco Polo claimed that Arab pilots had good nautical maps and used the Pole Star for guidance (Tibbets, 1971: 4). Furthermore, in the early Portuguese records there are indications that Arab (or Muslim)

navigators on the Indian Ocean, in addition to the traditional compass and instruments for astronomical observations,[15] also used nautical charts or written sailing directions, but none have been found (Tibbets, 1971: 272). It is as though academic cartography, too, remained irrelevant to mariners' practical activity.

23 Some of Ahmad ibn Majid's data may be recognized in 16th-century Arabic and Ottoman by Sulayman al-Mahri (*c.* 1511) and Sidi Ali Çelebi (wrote 1554), who uses both his Arabic precursors.[16] However, the indigenous line of written transmission subsequently appears to lapse under the newly-present European shipping. The Ottomans did not participate in Indian-Ocean navigation before their conquest of the Arab countries in 1516-1517, but they were previously engaged in Mediterranean sailing and early adopted European charts and practice,[17] inluding those relating to the Atlantic Ocean and the New World. There was, however, no overlap between major nautical traditions of these two water bodies due to differences of geography, hydrography and climate. In this case, as previously with classical geography, travel literature, and cartography, we observe that certain lines of communication prove very lasting, while others are overlooked or abandoned; some streams of information come together while others remain separate. There is common sense and expedience in abandoning Greek toponyms for Arabic ones, or substituting more recent authorities for ancient ones. On the other hand there is no clear reason why certain outdated information or concepts persist in the face of newer data continuously provided by new narratives and scholarship. Sea voyages were very different in execution from land travel, and on the eve of the Portuguese era on the Indian Ocean, Arabic seafaring expertise was being recorded and shaped into formal encyclopedias and manuals. Naturally and necessarily, more than Arabs took part in the seafaring enterprise. Tradition and experience took centuries to produce an effective, though diffuse body of knowledge, but in the 16th century the new global reality dramatically changed the dynamics of oceanic activity and signaled an end to the Arab chapter in the Indian Ocean story.

Idrisi's sectional map of the Indian Ocean

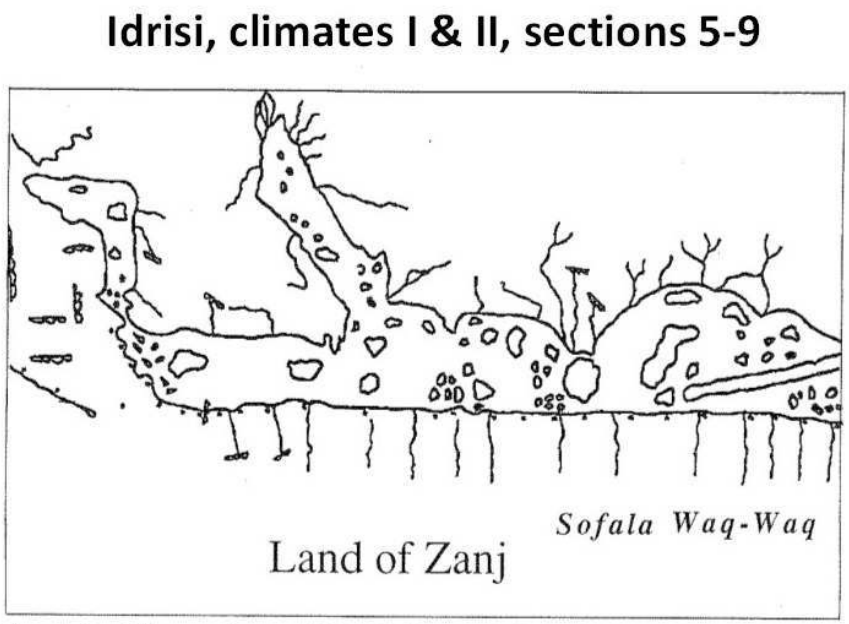

Figure 4. East Africa, according to al-Idrisi (mid-12th century). "Land of Zanj" is the coastal area south of Somalia. "Sofala" was the remote part of Zanj adjoining the land of Waq-Waq, identified as both Madagascar and southeast Asian islands.

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Tolmacheva, Marina. 2015. “АХМАД ИБН МАДЖИД И ПТОЛЕМЕЙ: АВТОРИТЕТ ПРЕДШЕСТВЕННИКОВ В НАУКЕ В СВЕТЕ ГЕОГРАФИЧЕСКИХ ЗНАНИЙ” (Ahmad ibn Majid and Ptolemy: the authority of predecessors in science as illustrated in geographical records). Srednevekovyi Vostok: Problemy istoriografii i istochnikovedeniia, ed. by Sh. M. Mustafaev. Baku: Elm, 2015, pp. 347-361.

NOTES

1. For a case study of Greek influence on Islamic geography as it relates to the Indian Ocean region, see Tolmacheva, 1991.
2. For map examples, see Harley and Woodward, 1987: Plates 15, 19, 29, 21.
3. For cartographical analysis see Ahmad, 1992.
4. The composite sectional world map was copied or imitated in A.H.1233/1818 A.D. See Ahmad, 1992, Fig. 7.22.
5. About this line of knowledge transmission see Tolmacheva, 2006.
6. For cartographic detail, see Fig. 1.
7. See a sample in Harley and Woodward, 1992, Plate 11.
8. For a complete English translation of the *Rihla* see Ibn Battuta, 1958-2000. For a chronologically-sequenced historical contextualization of Ibn Battuta’s travels, provided with maps, see Dunn, 2012.
9. Al-Qumr may mean both Madagascar and the Comoros. I have made a few minor changes to the cited translation.
10. The year A.H. 626 began 30 November 1228 (Smith, 2008: 138, not 3).
11. For Ibn Majid’s full name and list of compositions see *Encyclopaedia of Islam* (EI_2), vol. 3, pp. 856-859. Facsimile texts from the BibliothÈque Nationale in Paris are reproduced in Ferrand, 1921-1928, vols. 1-2.
12. For more on Ibn Majid and Ptolemy see Tolmacheva, 2015.
13. For more on the Mountain of the Moon in Ptolemy see Huntingford, 1980, App. 6.
14. For nautical charts, see: Tibbets, 1992 and Schwartzberg, 1992.
15. For an early European description see Prinsep, 1928.
16. For these two authors see Ferrand, 1921-1928, vol. 2 and Sidi Çelebi 1834-39.
17. For Muslim Mediterranean charts see Soucek, 1992.

ABSTRACTS

The focus of the proposed paper is the transmission of geographical knowledge about the Indian Ocean in medieval Arabic scholarship. The goal is to observe, confirm or articulate the probabilities of knowledge transmission across time and massive diversity of Islamic societies of the region and to assess its place in the history of Islamic science and civilization. Two vectors of knowledge transfer are explored: (1) between formal and informal geographical records and (2) between academic geography and the practical knowledge of the ocean and its coasts by Indian Ocean mariners.

O foco do artigo é a transmissão do conhecimento geográfico sobre o Oceano Índico nos estudos arábicos medievais. O objetivo é observar, confirmar ou articular as probabilidades de transmissão de conhecimento através do tempo e da diversidade massiva das sociedades islâmicas da região e acessar seu lugar na história da ciência e civilização islâmicas. Dois vetores de transferência de conhecimento são explorados: (1) entre registros geográficos formais e informais, e (2) entre a geografia acadêmica e o conhecimento prático do oceano e suas costas pelos marinheiros do oceano Índico.

El objetivo del artículo es la transmisión del conocimiento geográfico del Océano Índico en estudios árabes medievales. El objetivo es observar, confirmar o articular las probabilidades de transmisión del conocimiento a través del tiempo y de la enorme diversidad de las sociedades islámicas en la región y acceder a su lugar en la historia de la ciencia y la civilización islámica. Dos vectores de transferencia de conocimiento se exploran: (1) entre los registros geográficos formales e informales, y (2) entre la geografía académica y el conocimiento práctico de los océanos y sus regiones costeras por los marinos del Océano Índico.

L'objectif de l'article est la transmission de la connaissance géographique de l'océan Indien en études médiévales arabes. L'objectif est d'observer, de confirmer ou d'articuler les probabilités de transmission du savoir à travers le temps et la diversité massive des sociétés islamiques de la région et d'évaluer sa place dans l'histoire de la science et de la civilisation islamique. Deux vecteurs de transfert de connaissances sont explorées: (1) entre les enregistrements géographiques formelles et informelles et (2) entre la géographie académique et la connaissance pratique de l'océan et de ses côtes par les marins de l'océan Indien.

INDEX

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AUTHOR

MARINA TOLMACHEVA

Washington State University
tolmache@wsu.edu